

## **Chapter 6.9 DEQ REGIONAL WATER QUALITY INITIATIVES for the 2004 REPORTING PERIOD**

- **Southwest Regional Office (SWRO)**

### **Town of Chilhowie**

SWRO staff has been instrumental in the upgrade of the Town of Chilhowie sewage treatment system. The Town operated a lagoon system with inadequate UV disinfection resulting in bacteria violations in the effluent to Middle Fork Holston River. The plant has upgraded to an activated sludge treatment system that produces very high quality effluent that is now disinfected to meet water quality standards.

### **Town of St. Charles**

SWRO has proposed for many years that the Town of St. Charles should abandon their outdated STP and pipe wastewater to the regional wastewater plant operated by the Town of Pennington Gap. In August 2003 this project was completed. As a result of this project, previously unsewered areas upstream and downstream of St. Charles can now be provided with sewer service. Hundreds of homes that discharge raw sewage into the stream in these unsewered areas can now be served by a sewerage system. This will remove a major source of the bacterial loading to have straight pipes that discharge raw sewage directly into the stream causing bacterial violations in Straight Creek.

### **PCB Source Identification**

SWRO staff are coordinating efforts to address PCB contamination in Levisa Fork, Knox Creek, Beaver Creek and Bluestone River. The streams have been posted by VDH to notify the public that fish tissues are contaminated and consumption advisories are in effect. The staff is involved in developing TMDLs for benthic or fecal impairments in these segments. While the stakeholders are actively involved in the current TMDL work, the staff wishes to gain information from possible PCB sites in the watersheds.

As a result of stakeholder involvement, DEQ, with assistance from DGIF, has completed additional sediment and fish tissue sampling in the Bluestone River and Knox Creek. The study has heightened local concerns for the potable water supply since the Town of Bluestone has a water withdrawal on the Bluestone River within the affected segment. DEQ, VDH, and the Town are discussing ways to sample and identify any threat to the continued safety of the public water supply.

The goal of the watershed studies is to ensure that no active PCB contributions continue and to determine if a clean up may be necessary in these watersheds. The information gathered will be used to develop the TMDLs in all four PCB contaminated stream segments.

### **Russell Lumber- Batie Creek**

Sawdust from a sawmill operation accumulated into a huge pile by the mid 1990's in the karst area called "The Cedars" in Lee County. This resulted in the formation of an extremely strong sawdust leachate with BODs as high as 15200 mg/l that percolated through the karst features directly into the groundwater regime. The contamination then migrated to the Batie East and Batie West springs. The discharge of these springs, which form Batie Creek, resulted in gross contamination of Batie Creek. Water quality data accumulated through a continuing monitoring program at the Batie Creek project since 1997 proves that the removal of the "New" sawdust pile, which is the largest and accounts for 41% of the total, has resulted in a nearly total recovery in water quality of Batie Creek. Batie East Spring shows a 99% recovery, Batie West Spring demonstrates an 89% recovery and Batie Creek mix point shows a 99% recovery. The small amount of leachate remaining demonstrates a 68% reduction in waste strength. Water quality monitoring will continue until the site shows complete recovery.

- **Valley Regional Office (VRO)**

### **The South River Science Team**

The South River and the South Fork Shenandoah River have been under fish consumption advisories since the 1970s, when mercury was discovered in the system. The current advisory extends from the South River in Waynesboro to Front Royal on the South Fork Shenandoah River. It is believed that the primary source of the mercury in the system is from past (pre-1950) disposal and operational practices at the DuPont Waynesboro plant. Supported by a trust fund from a 1988 settlement between the State Water Control Board and DuPont, DEQ conducts regular monitoring of fish, sediments, and water and shares the results with VDH to ensure that data are accurate and the public is informed of risks from fish consumption. The most recent DEQ fish sampling results can be found on the DEQ web site at <http://www.deq.virginia.gov/rivers/mercury.html>.

Since November 2000, the DEQ Valley Regional Office has been participating in a unique partnership with industry, other state agencies, local officials, academia, and citizen groups. This group is referred to as the **South River Science Team**. The goal of this group is to look beyond the routine long-term mercury monitoring conducted in the South River by DEQ. Areas of focus include filling data gaps, reviewing new technologies, addressing outstanding risk-based questions, evaluating the potential for remediation, and ensuring that there is effective communication between stakeholders.

Cooperating organizations include:

- DEQ
- DuPont
- DGIF
- VDH
- James Madison University
- Eastern Mennonite University
- Virginia Tech
- VIMS
- Friends of the Shenandoah
- Isaac Walton League

The Science Team meets approximately every two months to share data, discuss ongoing monitoring and research efforts (both within and beyond the South River area), and prioritize needs for future mercury-related work in the Shenandoah River basin. In addition to regular representation from the groups identified above, the group also invites several internationally recognized mercury experts to an annual fall meeting for the purposes of sharing case studies and seeking advice on details of planned work.

#### **Highlights of the South River Science Team during 2003 include the following:**

- Continued collaboration with stakeholders, along with interaction with internationally-renowned experts in mercury research
- Surface water trend monitoring and bimonthly sampling by DEQ, using new, “clean” methods, allowing detection at much lower concentrations than those measured historically
- Continuation by DEQ of intensive closely spaced water-sampling efforts in the Waynesboro area to identify areas where mercury may still be entering the river. Recent samples, coupled with DuPont stormwater sampling (see below) suggest the possibility of ongoing inputs of mercury from the Waynesboro DuPont plant site. Follow-up sampling is planned
- Stormwater sampling along the Waynesboro, DuPont Plant site, both during base flow and storm conditions
- Ongoing evaluation of sediments and soils along South River
- Evaluation of mercury uptake in crops and grown in areas of mercury-contaminated soils
- Support and oversight of South River mercury research projects by Virginia Tech and JMU, addressing mercury fate in fish and freshwater clams.
- Ongoing production of a semi-annual newsletter, providing information to stakeholders on mercury contamination and other resource information

- **West Central Regional Office (WCRO)**

### **Third Annual Virginia Tech Farm and Family Showcase (2003)**

The Third Annual Virginia Tech Farm and Family Showcase was held September 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> 2003 at Virginia Tech's Kentland Farm. The portion of the Farm & Family Showcase in which DEQ participated provided exhibits on water, air, waste and tank programs. DEQ staff also led seminars and guided tours. Specifically, the riparian zone along Toms Creek flowing through the VT farm has been incorporated into the **Tom's Creek Streamside Conservation Project**, which showcases 'cost share' best management practices available to area farmers and landowners as both pollution prevention opportunities and TMDL solutions. The **Tom's Creek Streamside Conservation Project** is permanent to allow for educational exposure opportunities (4-H, school field trips, etc.). Permanent signage for this area, including a 4x8 redwood sign, identifies all agencies involved and a brief description of the riparian area BMPs. The DEQ provided \$1294.00 to assist in this project. Over 40,000 people visited the Showcase in its third year.

### **PCB Source Investigations in the New River VDH Fish Consumption Advisory Area (2002 – 2004)**

An intense search for PCB sources is underway in the New River watershed from Claytor Lake Dam (upstream and outside the Advisory Area) to the Virginia-West Virginia State line near Glen Lyn. The investigation involves extensive review of VA DEQ agency records, interviews of local officials, citizens, industry representatives, and information provided by the New River PCB Source Study Citizen's Committee. Based on these interviews and follow-up onsite inspections, DEQ teams sampled soil and sediment from multiple areas in the New River Valley in the fall of 2003. The investigation incorporates approximately 50 sites of sediment and soil samples. Laboratory analytical results are pending.

### **TMDL Studies in WCRO**

WCRO initiated studies for 18 TMDL segments during the 2002-2004 biennium. These studies include 7 benthos and 11 bacteria impairments in watersheds located in the James, New, and Roanoke. WCRO is conducting 3 load duration studies (in-house), and is partnered with EPA for the Blackwater TMDL study, DCR for the Stroubles Creek TMDL, Roanoke-Allegheny Regional Planning District Commission for the Tinker Creek Watershed study, and the Highland RC&D for the New River Valley TMDL studies. WCRO monitoring staff has provided TMDL data support at over 50 TMDL stations and WCRO collected data at 27 Bacteria Source Tracking (BST) stations.

### **First Load Duration TMDL Study – South Mayo River (2003)**

South Mayo River is a tributary of the Mayo River (Roanoke River drainage) in Patrick County, and is 303(d) listed for bacteria contamination. A load duration TMDL study was initiated to characterize the problem and identify source of bacteria in the watershed. This innovative, cost effective approach TMDL provides state government with the necessary tool to conduct in-house TMDL studies in appropriate watersheds. WCRO provided informative memos on land cover data and block census data analysis to help VDEQ staff in other regions perform load duration studies in other watersheds. TMDL outreach posters were created and shared with VDEQ staff in other regions via the Intranet.

### **Piedmont Control Station Survey 1999**

DEQ and EPA are developing a new biomonitoring database. Early in the development stage, we identified the need for more Piedmont control sites of all size streams. WCRO performed a search for new Piedmont controls though none of the sites appear adequate. A summary of the data was sent to the EPA database contractors.

### **Jackson River Dissolved Oxygen Studies**

The Jackson River is one of the primary streams forming the James River. It is an exceptional state resource upstream of the City of Covington, VA, but is severely impaired at and below the Rt. 60 Bridge in Covington. The Jackson River has been monitored for several years for dissolved oxygen

levels finding diurnal dissolved oxygen criteria violations. These data are regularly summarized and reported.

### **Forest Service biomonitoring data Review and Documentation 1999 - 2002**

In 1999, the U.S. Forest Service submitted a large amount of data to DEQ for inclusion in the 305(b) report. Examination of the data indicated several of the streams assessed by the Forest Service as impaired were listed because of lack of stream flow. WCRO initiated a study of several of these 'impaired' sites to determine if they were perennial streams. DEQ site visits continue as well as comparison of macro invertebrate collections. Most of the streams visited are intermittent streams. WCRO wrote an opinion paper suggesting these data not be used for the 305(b) because it is not the purpose of the 305(b) to list streams because of naturally low flows.

### **Lakes Monitoring**

WCRO has five large lakes, which are primary recreational waters. WCRO continues to sample these high value waters several times a year to track water quality. In recent years these data have proven to be valuable due to high citizen concern over water quality in these lakes. In 1999, we began sampling these lakes six months each year. These data are and will be used in future Integrated Reports.

### **Smith River Biomonitoring Studies 1997-1998**

The Smith River has been an area of special interest for several years due to impaired benthic communities and reports of illegal discharges and accidental spills. In 1997 WCRO initiated several studies of the biological community in the vicinity of several discharges in the Martinsville area. These data were used in regular biomonitoring reports and special reports.

### **Smith River Bioaccumulation and Sediment Study 1997-1998**

In 1997, WCRO initiated a study to determine if benthic impairments in the Smith River were due to a bioaccumulative toxic substance. These data are outside the current 2004 Integrated Report data window but are useful for future macro invertebrate studies. Corbicula were placed in enclosures in the stream below several of the major dischargers to the river. While no bioaccumulative metal or organics were found in the stream, there was significantly higher mortality among Corbicula below the Martinsville and Lower Smith STPs. These data can be interpreted to mean a toxic problem exists in the stream but the toxic compound is not bioaccumulative. This would be consistent with an effect caused by chlorides known to be in high concentrations from both wastewater treatment plant effluents prior to the closing of several textile manufacturing facilities. This effect is probably related to the regulated flow from Philpott Reservoir, which discharges extremely soft water. At high flows the STP effluents are diluted with soft water while at low flow the stream is influenced by the discharges. Textile plant closings have greatly reduced the amount of chlorides in both effluents with improving benthic conditions anticipated in the Smith River.

### **Smith River Fish Shocking 1998-1999**

The Smith River has been biologically impaired for several years. In 1998 WCRO coordinated with the DGIF to conduct a fish community assessment. Due to sampling equipment problems stream findings were not conclusive, however the community appeared to be less diverse below the Martinsville and Lower Smith STPs. In 1999 we returned with different equipment and found the fish communities below these same plants to be much better than originally believed. Whether the fish community improved between years or the difference was due to better sampling equipment is not known. In 1999 improvements were also seen in benthic invertebrates which were not effected by sampling gear. This report is being prepared by the DGIF.

### **Floyd Temperature Study 1998**

In 1998, WCRO performed a study of thermal effects of the Floyd STP. No temperature effects were observed in the stream.

### **American Heritage Rivers Initiative (1997-1998)**

In February of 1997 President Clinton announced the American Heritage Rivers Initiative in his State of the Union address. Application guidelines were published in the fall of 1997. A task force of community leaders from the counties of Ashe and Watauga in North Carolina and Grayson County, Virginia, came together to pursue application for the designation of the New River as an American Heritage River.

On July 30, 1998 President Clinton and Vice President Gore traveled to Ashe County to designate the New River an American Heritage River. The New is now one of fourteen designated American Heritage Rivers in the nation. These initial efforts have grown to encompass the entire New River drainage from North Carolina through Virginia to West Virginia. The American Heritage River designation means grass roots organizations and communities in the New River Basin are afforded streamlined access to federal resources to develop and seek funds for projects related to economic revitalization, agriculture, natural resource and water quality protection, historic and cultural preservation and education. Streamlined access is accomplished through communications with and assistance from the New River Community Partners Board and the River Navigator.

The New River Valley Planning District played a major role in coordinating and conducting public meetings in Virginia to bring community and civic leaders, and local and state representatives together to develop a watershed plan. A completed work plan for the entire New River was formally released on July 26, 1999. DEQ staff participated in this community process.

### **Priority NPS Watershed Monitoring for Water Quality (1997)**

A 604(b)-funded special study was conducted in two watersheds located in the Roanoke Valley. These data are outside the 2004 Integrated Report data window but compose part of the basis for the Impaired Waters Listing. Water quality variables were intensively monitored over four months. Watersheds L04R and L05R were both reported as having high potential for urban nonpoint source contributions (nps) and low potential for agricultural and forestal nps pollution (1996 305(b) Report, VA DEQ). The study found reported potentials were only partially correct. Urban impacts were detected in both watersheds, particularly L05R but unreported agricultural impacts were also detected in L05R. In addition three of the four main creeks sampled exhibited sufficient total fecal coliform bacterial exceedences to be classified as impaired for the primary contact use.

- **South Central Regional Office (SCRO)**

#### **Total Maximum Daily Load (TMDL) Activities**

There are currently seven (7) TMDL projects being conducted by the South Central Regional Office's water compliance and assessment staff. The projects are listed in detail below.

#### Appomattox River Basin-wide TMDL:

The bacteria TMDL study has encompassed the entire Appomattox River Basin from its headwaters to the mouth at the James River. The study originally would have only addressed the mainstem Appomattox, but with the amount of impaired tributaries that have been discovered since the initial listing, it seemed appropriate to address the watershed as a whole. In conjunction with the Piedmont Regional Office (PRO) there have been several technical advisory committee meetings and public meetings to be sure all necessary federal, state and local stakeholders, as well as the general public are involved in the TMDL development process.

#### Ash Camp Creek:

A special study was conducted prior to the TMDL development process to attempt to pinpoint the source of the benthic impairment. SCRO sampled three (3) different stations for fecal coliform, BOD<sub>5</sub>, total suspended solids and nutrients. The samples were taken a week apart, during wet and dry weather events, and field parameters in the morning and afternoon. The study showed that there was a recovery point downstream of the Keysville WWTP, where the reference station is located. There is a segment between the reference station and impaired station in which cattle has access to the stream. This situation has increased the sediment loading in Ash Camp Creek and decreased the quantity and quality of suitable habitat for benthic macroinvertebrates. This study, as well as additional biological surveys and a 24-hour diurnal dissolved oxygen study have aided in the process of developing the TMDL.

#### Birch Creek:

The bacteria TMDL study has addressed the entire Birch Creek watershed addressing all possible sources. There have been several watershed improvements implemented in the watershed prior to the TMDL development process. The Halifax Soil & Water Conservation District has aided in placing a considerable amount of land in the CREP program, specifically that land that surrounds the impaired stream segment. These actions have been a step in identifying the source of bacteria in the watershed.

#### Falling River Watershed:

The Falling River watershed TMDL study is fairly similar to that of the Appomattox River Basin. The study will involve addressing four (4) different watersheds including Mollys Creek, Little Falling River, Falling River and its headwaters. The three watersheds that drain to the original impaired segment of Falling River had not been monitored or assessed for several years. By incorporating these watersheds into the TMDL study it provides a clearer picture of identifying the source of the bacteria and the location of these sources. There have been several technical advisory committee meetings and public meetings to ensure that there is participation from every watershed involved in the study.

#### Flat Creek (Mecklenburg County):

The portion of Flat Creek that is located below the South Hill WWTP is impaired for total fecal coliform, as well as the General Standard (benthic). Both TMDL studies are currently being performed by SCRO. The total fecal coliform TMDL is being calculated in house by the TMDL coordinator in conjunction with federal, state and local officials, as well as riparian land owners.

#### Unnamed Tributary to Hurricane Branch (Nottoway County):

The benthic-impaired portion of the unnamed tributary to Hurricane Branch is located on the Fort Pickett Military Reservation. There have been several stakeholder meetings and public meetings, as well as stream walks to try and determine the source of the impairment.

#### Twittys Creek:

There have been several sampling events done in the Twittys Creek watershed to determine the source of the benthic impairment. A diurnal dissolved oxygen study was completed in August to determine the affect of the industrial and municipal point sources that discharge to the impaired segment. The 24-hour DO study showed no adverse effects as a result of the nutrients discharged from these two point sources. There has also been clean metal sampling done to determine what affects historic copper mines in the watershed would have on benthic macroinvertebrates in Twittys Creek. The historical information was made aware to SCRO through technical advisory committee meetings, as well as the public meetings that have been held throughout the TMDL development process.

### **Freshwater Probabilistic Monitoring Program**

A full-time staff biologist was hired for the South Central Region in the summer of 2003. Prior to that time other regional biologists were assisted by SCRO monitoring staff to sample 26 randomly selected sites from 2001-2002. Each station is sampled twice for benthic macroinvertebrates, habitat assessments, and chemical and field data. Several stations were only visited once due to poor

accessibility or lack of resources. The SCRO monitoring staff is currently sampling 12 stations in support of the freshwater probabilistic monitoring program for 2003.

### **Coordination with other Federal, State and Local Agencies**

The SCRO water staff has participated in several outreach programs with other federal, state and local agencies across the region in the past year. The first annual Army Earth Day was held at Fort Pickett in April of 2003, in which DEQ-SCRO was an invited guest presenter. SCRO water staff presented parts of the regional monitoring plan, as well as an explanation of what duties DEQ is tasked with for protecting water quality. The presentation was well received by the public, as well as other presenters in attendance. A SCRO staff member was asked to attend a recent meeting of USDA-NRCS field personnel to give a brief introduction to the TMDL process. A similar presentation was given to attendees of the Amelia County Cattlemen Expo, which was held in September of 2003. SCRO anticipates that the collaborative efforts put forth by these agencies will result in an improvement in water quality in TMDL watersheds, prior to TMDL development.

- **Piedmont Regional Office (PRO)**

### **Coastal 2000 Initiative - Water Quality, Biomonitoring and Sediment Toxicity of Virginia Estuaries**

PRO and TRO sampled 47 randomly selected probabilistic estuarine stations on the western and eastern Chesapeake Bay shores and the oceanside of the Eastern shore in summer 2001. Sampling crews obtained filtered chlorophyll a and nutrients, particulate nutrients, total suspended solids, benthic infauna, sediment metals, organics, particle size, and toxicity samples, light attenuation data, and depth profiles for DO, temperature, pH, conductivity and salinity. Each station was sampled once. Field duplicate samples were collected at one station per run, to cover 10 percent of samples for each parameter. Hydrolabs were pre- and post-calibrated and maintained according to agency SOPs. The study is proposed to continue for four years, with new stations selected each year. Probabilistic studies answer questions such as "What percentage of Virginia estuaries have low dissolved oxygen?" First year results are pending.

### **James River Combined Sewer Overflow (CSO) Special Study, 1994 through October 2001**

PRO performed a special study to document changes in the fecal coliform bacteria and dissolved oxygen levels above and below CSO outfalls in James River Park and the tidal James River at Richmond, VA from 1994 through 2001. An enlargement of the CSO lines and a south channel diffuser, a major improvement in the CSO system through the Fall line, went online in winter 1998. PRO sampled 14 non-tidal sites through the Fall line, and 16 tidal stations from Richmond downstream to just above the mouth of the Appomattox River, twice per month from May through October each year. A final report is pending.

### **Lead and Other Metals in Sediments of the Tidal Fresh James River near Rocketts Landing / Grantham Property below Richmond, VA.**

PRO waste staff discovered a large battery disposal area beside the James River at Rocketts Landing, lat 37 30 56, long 77 25 01, in early September 2000. An Environmental Site Assessment of the property documented soil lead levels up to 48 percent adjacent to the river. The study sampled lead and other metals in estuarine river sediments from both near-shore and near-channel sites. Ten (10) sediment samples were obtained by Petit Ponar dredge immediately off the center of the battery site, and at locations at incremental distances upstream and downstream of the site. PRO sampled the stations once during Fall / Winter 2000/2001. Duplicate samples were collected to cover 10 percent of stations.

### **Results:**

Lead (Pb) in sediment ranged from 21.9 ppm 80 meters below the Rocketts Landing site up to 502 ppm for the sediment sample 200 meters below the Rocketts Landing battery site, and 302 ppm directly off the battery site. Both of the latter concentrations exceeded the ER-M value for lead of 218 ppm. The ER-M (Effects Range – Medium) is a part of the Effects Range sediment quality guidelines established by the NOAA. The guidelines were developed to identify concentrations of contaminants

associated with biological effects in laboratory, field, or modeling studies. The ER-M is the concentration equivalent to the 50<sup>th</sup> percentile of the compiled study data. Sediment concentrations above the ER-M are frequently associated with adverse effects on animals that live in the sediment. This segment of the James River below Richmond, VA is considered threatened for aquatic life use in the year 2002 assessment cycle based on these sediment lead findings.

Station	Description	Pb, mg/kg (ppm)
2-JMS109.77	James River 0.2 mi below I-95	29
2-JMS109.47	James River DS of City Locks	52.4
2-JMS108.92	James River opposite Richmond STP	86.3
2-JMS108.77	Upstream boundary of battery site	67.8
2-JMS108.76	James R off Rocketts Landing battery site	308 (ER-M viol.)
2-JMS108.74	Downstream boundary of battery site	51.7
2-JMS108.71	James River 80 m below Rocketts Landing	21.3
2-JMS108.63	James River 200 m below Rocketts Landing	502 (ER-M viol.)
2-JMS108.44	James River 515 m below Rocketts Landing	39.5
2-JMS106.35	James River opposite DDS SIMS metal	45.9

#### **Five Menhaden Fish Kills in the Mobjack Basin, July - August 2001**

PRO investigated five fish kills in the Mobjack Bay area from July 9 to August 16, 2001. The fish were juvenile menhaden in the 2 to 3 inch size class. The kills occurred in Heywood Creek in the Severn River (1000+ fish) on July 9, Back Creek in the North River (40,000 fish) on July 14, an unnamed tributary of Wilson Creek in the Ware River (50,000 fish) on July 18, Put In Creek in the East River near Mathews (440,000 fish) on July 30, and again in Put In Creek (3000 fish) on August 16.

Each event involved large schools of juvenile menhaden swimming into shallow headwater coves on flood tides in the evening, and remaining through ebb tide during the night, with mortality caused by depleting the dissolved oxygen, until the fish kills were discovered at morning. There were no lesions on the fish. Menhaden are known to be especially prone to low dissolved oxygen kills. PRO sampled for nutrients, chlorophyll a, biochemical oxygen demand, solids, algae ID, and *Pfiesteria* DNA probes in each event. *Pfiesteria* DNA probes were negative for *Pfiesteria* and related dinoflagellate algae in each event

#### **Commonwealth of Virginia *Pfiesteria* Response and Monitoring Program**

For the months of May through October during the years 1998 through 2001, DEQ collected water quality and algae samples at up to 20 Cohort stations and 22 water quality stations in support of the Virginia Department of Health Cohort study. This combined medical and environmental study investigated whether a relationship could be found between health characteristics of persons working on Virginia estuaries and estuarine water quality. DEQ collected a full range of water quality analyses - including dissolved, particulate and total phosphorous and nitrogen, urea, chlorophyll a, biochemical oxygen demand, total suspended solids, total organic carbon, and *Pfiesteria*-Like Organism (PLO) algal cell counts and identification performed by Old Dominion University. In 2000 and 2001 staff also sampled for *Pfiesteria* and other harmful algal bloom species by DNA probe identification, with the analysis performed by the Virginia Institute of Marine Science (VIMS). In 2000 and 2001, DNA probes identified *Pfiesteria* and related algal species in low concentrations in the Pocomoke, Coan, North, and East Rivers; and in Mattox, Indian, Skiffes, Kings, Occahannock, Onancock, and Pungoteague Creeks; and in Hodges Cove. The DNA probe cannot identify whether the species found are in toxic life stages. Agency staff also responded to fish kill events possibly caused by *Pfiesteria*. Most were juvenile menhaden kills attributed to low dissolved oxygen and stranding overnight at low tide, in most instances no lesions were observed on these fish, PLO counts were low, and DNA probe results were negative. VIMS also concurrently performed fish trawls for the cohort study.

#### **Three Dinoflagellate Algae Blooms Followed by Fish and Crab Kills in Potomac Embayments in summer 2000**



PRO investigated three dinoflagellate algae blooms which caused multi-species fish and/or crab kills in Potomac embayments in Westmoreland and Northumberland Counties in summer 2000. The first bloom occurred from late April through mid-May 2000, and was dominated by the dinoflagellate Prorocentrum minimum, a non Pfiesteria-like algae that causes mahogany water color during a bloom. The bloom was found in Monroe Bay, Mattox, Nomini, Lower Machodoc Creeks, Yeocomico and Coan Rivers and smaller tributaries. The bloom was also documented in the Potomac River from below Morgantown Bridge to the mouth. In its early stages, the bloom elevated dissolved oxygen (DO) to 15 mg/l and pH to above 9, and as the bloom died in mid-May, DO dropped to less than 2 mg/l in all the above tributaries resulting in the fish and crab kills.

The second dinoflagellate bloom occurred in Jackson Creek in Westmoreland County and Cod Creek in Northumberland County during the second week of June. The dominant species of algae was Gyrodinium galatheanum, a Pfiesteria-like organism. Both creeks experienced multi-species fish kills of more than 2000 fish, and had DO levels less than 1 mg/l during the kills. Both these waterbodies were very shallow which would promote dense algal growth and subsequent complete DO loss when the bloom died.

The third fish kill was reported in Lodge Creek, a tributary of the Yeocomico River, on August 4. Menhaden were swimming erratically and being eaten by birds. Many of the fish had frank lesions. DO was 1 to 2 mg/l deeper in the water column. The water was reddish brown in color, and the dominant dinoflagellate was Gymnodinium sanguineum, a non Pfiesteria-like organism.

#### **Probabilistic Biomonitoring and Chemical Monitoring Program in Virginia Non-Tidal Streams**

PRO sampled 15 randomly selected probabilistic non-tidal stream stations in the Piedmont and Coastal Plain ecoregions in Spring and Fall 2001. A total of 50 streams ranging in size from first order to sixth order were sampled statewide. The Regional Biologist gathered representative samples of benthic macroinvertebrates, performed comprehensive habitat assessments, and obtained DO, temperature, pH, and conductivity data. Each station was sampled twice, once in the spring and again in the fall. Fall sampling included water quality samples for nutrients, solids, chlorophyll a and fecal coliform bacteria. Hydrolabs were pre- and post-calibrated and maintained according to agency SOPs. The study is proposed to continue for four years, with new stations selected each year. Probabilistic studies answer questions such as "What percentage of Virginia non-tidal streams have impaired benthic communities?" First year results are pending.

#### **Tributyltin (TBT), in Sediments of the Tidal Fresh James River below Richmond, VA.**

TBT sediment levels in the tidal fresh James River between Richmond and Hopewell, VA are largely unknown. One sample from near the Richmond City / Chesterfield County line at rivermile 106 in 1998 reached 3.8 ppb. A water sample during dredging near this point in 1999 reached 4 pptr (parts per trillion). One other sediment sample from below Turkey Island Cutoff at rivermile 79.0 in 1999 held 14 ppb TBT. The US Navy derived a TBT sediment screening value of 250 pptr (0.25 ppb) in an analysis of TBT data from San Diego Bay, CA, Norfolk region, VA, Pearl Harbor, HI, Puget Sound, WA, Narragansett Bay, RI and Galveston Bay, TX, based on ecological risk assessment principles.

The study sampled TBT in estuarine river sediments and water from both near-shore and near-channel sites at seventeen (17) locations from rivermile 107 below the mouth of Goode Creek to rivermile 76 off Hopewell, VA, at areas of heavy vessel traffic. Seven (7) water samples were collected at the heaviest areas of ship traffic in this segment. PRO sampled stations once during Summer/Fall 2000. Virginia Institute of Marine Science (VIMS) research staff performed the TBT analysis.

## Results:

TBT ranged from below the detection limit of 0.5 ppb dry weight in sediment up to 8 ppb for the sediment sample at the Port of Richmond (Deepwater Terminal). No water samples contained detectable TBT. The detection limit in water was 1 ng/l (pptr). VIMS research staff did not consider these levels high for areas that see heavy vessel traffic. However it is not known whether these levels pose a risk to aquatic life.

Station	Description	sed, ppb	water, pptr
2-JMS106.40	Embayment Below Buoy 168 Site 1	0.54	ND
	Duplicate	0.76	ND
2-JMS106.40	Embayment Below Buoy 168 Site 2	0.67	
2-JMS106.40	Embayment Below Buoy 168 Site 3	ND	
2-JMS106.40	Embayment Below Buoy 168 Site 4	0.76	
2-JMS106.40	James R channel edge Below Buoy 168	ND	
2-JMS106.90	0.5 mi US Embayment Below Buoy 168	0.71	
2-JMS105.90	0.5 mi DS Embayment Below Buoy 168	1.72	
2-JMS104.58	Off Deepwater Terminal	8.06	ND
2-JMS105.08	0.5 mi US Deepwater Terminal	ND	
	Duplicate	ND	
2-JMS104.08	0.5 mi DS Deepwater Terminal	3.56	
2-JMS078.99	Off Buoy 126 DS Turkey Is. Cutoff	2.57	ND
2-JMS079.49	0.5 mi US Buoy 126	4.32	
2-JMS078.49	0.5 mi DS Buoy 126	1.66	
2-JMS077.14	Off Hopewell, above Buoy 110	6.13	ND
2-JMS077.64	0.5 mi US Hopewell, VA	0.64	
2-JMS076.64	0.5 MI DS Hopewell, VA	1.07	
2-JMS157.28	James River at Cartersville Rt. 45	ND	ND

## Water Quality Upstream and Downstream of Permitted and Proposed Livestock Facilities in PRO

There were 27 permitted VPG and VPA livestock facilities in PRO with greater than 1000 hogs or 200 cattle planned or on-site when this program started in 1997. Water quality data above and below these sites was sparse. Occasional pollution responses and rare coincidental location of Ambient Water Quality monitoring stations nearby provided the only current data near these facilities.

PRO staff obtained surface water grab samples for BOD and TSS, a nutrient scans for nitrogen and phosphorus species, and fecal coliform bacteria during each station visit. Hydrolab collected dissolved oxygen, pH, water temperature, and conductivity data at each station visit. A total of 78 stations have been monitored during the course of the study. Most facilities had one upstream and one downstream station, however some facilities were geographically located so that upstream or downstream stations were not possible. Multiple upstream or downstream stations were selected where appropriate. All stations were monitored every other month, pending staff availability. Monthly monitoring was not logistically feasible due to the large number of stations.

If sample results identified water quality problems or standard violations related to particular facilities, these facility stations were additionally monitored during storm runoff events to document any ammonia, fecal coliform, or dissolved oxygen standard violations off-site, or any other permit violations. Field duplicate samples were collected at one station per run, to cover 10 percent of samples for each parameter. Hydrolabs were pre- and post-calibrated and maintained according to agency SOPs.

This study has identified many impaired stream segments since 1997. However, the impairment often occurred at both the upstream and downstream stations related to a facility. Thus determining causes of impairment were often difficult. The study is scheduled to continue at least through July 1, 2002, and is re-scheduled annually pending staff and resource availability.

## DEQ Actions Relative to Defense Supply Center (DSCR)

The Defense Supply Center of Richmond (DSCR), is a large federal material storage and distribution facility that is subject to numerous state and federal environmental laws and regulations. The Virginia Department of Environmental Quality (DEQ) interacts with this facility on a regular basis to assure that all applicable environmental rules are complied with. In addition, this facility has an active Superfund project to contain and clean up contamination from past operations on the site.

Due to recent newspaper stories about this facility, and the corresponding increase in public concern, the DEQ has taken several steps to address these concerns. In addition, DEQ continues to implement its normal compliance programs, and has taken appropriate actions to address problems when they are found. Following is a summary of recent actions taken by DEQ relative to the DSCR.

#### Water Quality Monitoring

Upon learning of public concerns about TCE (trichloroethylene) contamination in water leaving the site, DEQ staff collected water samples in cooperation with DSCR in May of this year. Samples were taken from an onsite stormwater pipe, and from the small stream (referred to as No Name Creek) that receives runoff from the DSCR facility. Analysis of the samples indicated low levels of TCE and some other contaminants; however, the concentrations were well below any established human health risk levels. Additional water samples have been taken in the area to verify that contaminant levels are below human health risk levels. **To date, no water sampling data has shown contamination at a level that would represent a threat to public health.**

#### Biological Stream Evaluation

A good indicator of pollution in a stream is the amount and diversity of aquatic life that exists there. A biological stream assessment was recently conducted in No Name Creek by a DEQ aquatic biologist. His findings indicated that the stream had aquatic organisms that were typical for a small stream in an urban area. There was no indication of unusual biological impacts.

#### Petroleum Release Investigation

Low levels of petroleum contamination have been found in a storm sewer pipe passing through DSCR and discharging into Kingsland Creek. Recent testing has determined the likely source of contamination to be fuel oil that may have leaked or spilled from an old underground storage tank that was removed in 1991. A plan for cleaning up the contaminated area has been developed and will be implemented soon. In the meantime, oil absorbent pads are being maintained in the storm sewer to minimize the release of contaminated water to the creek. The DEQ will continue to monitor DSCR's efforts to eliminate the source of the contamination and will assure that all appropriate actions are taken as required under the law.

#### Untreated Groundwater Release Investigation

On July 17, 2001, DSCR reported a release of untreated groundwater from their Superfund treatment system due to a mechanical failure. It is estimated that approximately 95,000 gallons of contaminated groundwater were released to No Name Creek from June 30 – July 6, 2001. The concentration of TCE in the released water was likely between 50 – 500 parts per billion. That would amount to from 0.04 – 0.4 lbs. of TCE. While it is possible that regulatory standards for TCE were exceeded in the stream during the period of the discharge, human health risk is considered low due to the temporary nature of the event. On Wednesday, October 7, 2001, DSCR reported a second release during an attempt to restart the upgraded pumping and treatment system. This time only about 600 gallons were released. The volume and probable concentration of contaminants is not considered a significant risk to human health or the environment. DEQ will continue its investigation and will take appropriate enforcement action.

#### Special Stream Study

Because of the concern expressed by local residents, DEQ has planned a special study to determine whether there is unusual contamination in No Name Creek due to stormwater runoff. The

study will involve taking water samples from the stream during and immediately following rainfall events, and testing for bacterial contamination, TCE and other contaminants. Special tests will be performed to determine if any bacteria found in the samples comes mostly from animal or human sources. Local residents may be requested to provide access to their septic systems to aid in this part of the study. If contaminant levels in the stream exceed state water quality standards, the stream will be added to the state list of impaired waters and addressed through programs established under the federal Clean Water Act. The lack of significant rainfall has prevented any significant progress in this study this fall.

#### Hazardous Waste Enforcement Action

DSCR has a permit to store hazardous waste on site. The DEQ regularly inspects for compliance with that permit. During a May 2000 inspection, DEQ staff found several technical permit violations and cited them in a Notice of Violation issued in June 2000. The violations consisted mainly of procedural problems that were quickly corrected. There were no releases of hazardous chemicals to the environment. Recently, DEQ and DSCR completed negotiations for a Consent Order that required DSCR to pay a fine of \$16,000. This order has been signed and the penalty has been paid.

#### Public Health Consultation Request

In response to recent newspaper accounts of citizen health problems and concerns in the vicinity of DSCR, the DEQ has requested the federal Agency for Toxic Substances and Disease Registry (ATSDR) to conduct a current public health consultation. The ATSDR had previously conducted a public health assessment of this area in 1993 as part of the Superfund project evaluation. No substantial correlation between the contaminated site and any public health effects were found at that time. The Chesterfield County Health Department is conducting a separate health study now, and will cooperate with any studies undertaken by ATSDR. The ATSDR must get funding authorization to fully undertake a study. However, they are already gathering data with the assistance of other agencies.

#### **James River Park Bacteria Study**

The 2002 303(d) list of impaired waters listed the James River through Richmond as impaired of the Recreation Use because of exceedences of the monthly geometric mean for fecal coliform. There is a dearth of real-time fecal coliform bacteria data available for the public to use in making decisions regarding the recreational use of the James River within James River Park in Richmond. Therefore beginning in August 2002, the Department of Environmental Quality and James River Park joined forces to expand the water quality monitoring conducted in the James River during the summer months.

Staff and volunteers from the park are collecting water samples to be tested for fecal coliform bacteria on a regular schedule from five locations on the river where there is heavy recreational use. The sites are listed below:

Ponypasture  
42nd Street in the river  
Texas Avenue Beach  
Belle Isle just above Hollywood Rapid  
Tredegar Iron Works

The water is sent to state laboratories for analysis funded by DEQ, and results are posted on the DEQ web site.

#### **PCB Source Assessment Study of the Tidal James River**

The Piedmont Regional Office (PRO) and Standards and Research Unit (SRU) of DEQ performed the first year of a multi-year toxic source assessment study for PCBs in the tidal James River from Richmond to Windmill Point from February to November 2003. This study was performed in response to the VDH fish consumption advisory for blue catfish and carp in the James River from Richmond to Queens Creek effective in 2002. SRU staff obtained 60 fish samples to better define the consumption advisory boundaries at the request of VDH. PRO staff sampled sediments at 55 locations,

August 2004

including all major industries and municipal sewage treatment plants with discharges to the James River in the Richmond to Hopewell area. The Virginia Institute of Marine Science is performing both sediment and fish tissue analyses. PRO also interviewed six major dischargers in the Hopewell area regarding past PCB use and possible spills.

Although not all the fish tissue results are complete, preliminary results indicate PCB levels ranging from 0.1 ppm to 1.7 ppm in blue catfish and carp downstream of the advisory boundary in the Chippokes area of the James River about 20 miles below Hopewell. These levels exceed the DEQ and EPA screening criteria of 0.054 ppm, with one blue catfish and one carp exceeding the VDH advisory limit of 0.6 ppm. Fish tissue results are expected to be complete in early 2004.

Preliminary results on 12 of the 55 total PCB sediment samples indicate PCB levels ranging from 0.0001 ppm to 0.776 ppm between Richmond and Hopewell, VA. Four of the sediment samples from the Hopewell area exceeded the DEQ assessment criteria of 0.18 ppm. Sediment results are expected to be complete in March 2004. Past sampling of 75 sites in the Hopewell area of the James River from 1997 – 1999 by DEQ, EPA and the ACOE indicated total PCBs in sediments in the 0.01 ppm to 32.8 ppm range. Forty-one percent of these samples exceeded the DEQ assessment criteria, however none of the samples were above the EPA clean-up level of 50 ppm.

SRU and PRO will design the second year of sampling based on high results from 2003, with a budget of approximately \$99,000. Preliminary plans include fish tissue monitoring in the James River above Richmond to check the upstream consumption advisory boundary, and sediment sampling to zero in on any high PCB levels found this year. As resources allow, PRO will also sample above and below the advisory boundaries at sites where PCBs might be found, such as some industries, sewage treatment plants, railroads, power plants or sub-stations, or old landfills.

- **Tidewater Regional Office (TRO)**

### **Elizabeth River Program**

Historically speaking, while significant research has been conducted in the Elizabeth River, it has been sporadic in nature and severely lacking in coordination among various research efforts. With Virginia's commitment to implement the Elizabeth River Watershed Action Plan as our toxics reduction strategy in this troubled river, a massive effort to restore this river is underway. In 1997, in response to indications of toxic impairment of water quality in the Elizabeth River and its tributaries, DEQ and a group of Elizabeth River Project stakeholders collaborated in contracting the consulting firm URS Greiner, Inc. to produce a comprehensive WQM plan for the water bodies of concern. Under guidelines included in that plan, a baseline environmental study began in January 1998, with the goal of allowing the future assessment of trends in contaminant concentrations and their effects. Scientists from the Virginia Institute of Marine Science, Old Dominion University, and Department of Environmental Quality - Tidewater Regional Office staff are working with representatives from state, federal, and local authorities and other stakeholders to design and conduct this monitoring effort. Unfortunately, recent economic crises have restricted financial resources for the Elizabeth River Program, and the intensity of monitoring and research has been reduced. Several specific activities that have been continued under this initiative are described below.

### **Conventional Pollutants / Nutrients**

DEQ and ODU continue to monitor for these parameters, which include such things as dissolved oxygen, nitrogen, phosphorus, pH, salinity and temperature. This monitoring, while done previously at a limited number of stations, was expanded to 14 stations in 1998 and now includes depth profiles and significantly more detailed nutrient analysis. Although the condition of nutrients and dissolved oxygen are still degraded, monitoring trends show significant improvements at many locations in the river (<http://www.chesapeakebay.odu.edu/Reports/reports.htm>). Data can be viewed and downloaded from the Chesapeake Bay Information System (CIMS) at <http://www.chesapeakebay.net/wquality.htm>

### **Dissolved Metals**

Upon review the available water column metals data from the River, the Elizabeth River Monitoring Committee has recommended that the monitoring of dissolved metals be suspended until adequate funding is restored to the monitoring program.

### **Fish Tissue Histopathology**

Recent academic studies indicate that a small, abundant and non-migratory fish known as a mummichog is an excellent indicator of adverse health effects attributable to pollutant exposure. An examination of internal organs has shown that numerous types of lesions, including cancer, can be observed and that the prevalence of these lesions may be directly related to the levels of certain pollutants in the environment. Working with Dr. Wolfgang Vogelbein of VIMS, DEQ has incorporated monitoring of this type into the Elizabeth River Monitoring Program at 12 stations in the Elizabeth River. Existing data generated by this DEQ histopathology monitoring show that, for certain types of liver lesion, prevalence can range from a low of 1.7% in fish collected in the Lafayette River and Western Branch to as high as 85% of the fish collected in the Southern Branch. (Vogelbein and Zwerner, 2000). A final draft report on the 2001 fish histopathology monitoring, including an evaluation of sediment PAH values, is currently under review. The revision was not concluded prior to mid-December. Consequently, a summary of the findings will be included in next year's TRISWat Report.

### **TBT Monitoring**

Tributyltin (TBT) data have been collected at 18 Stations in the Elizabeth River, Hampton Roads and the lower James River six times a year since August 1999. Only rarely have non-detectable (less than 1 part per trillion) levels of TBT shown up in these data. The highest measured concentrations occurred on September 20, 2001 with several stations near the confluence of the Eastern and Southern Branches exceeding 20 ng/L and the highest measured concentration was greater than 70 ng/L at a station in the Southern Branch. However, no exceedences of the acute standard (360 ppb) have been observed. A summary of the monitoring results can be viewed at [http://www.vims.edu/env/projects/tbt\\_deq/](http://www.vims.edu/env/projects/tbt_deq/).

### **Benthic Index of Biotic Integrity (BIBI) monitoring**

Dr. Dan Dauer (Old Dominion University) initiated a study of the macrobenthic communities of the Elizabeth River watershed in summer 1999 as a means of characterizing the health of the benthic communities of the Elizabeth River watershed. A probability-based sampling design allows calculation of confidence intervals around estimates of condition of the benthic communities and allows estimates of the areal extent of degradation of the benthic communities. Based upon probability-based sampling the estimate of benthic bottom not meeting the benthic restoration goals was 76 % in 2002, 52 % in 2001, 72 % in 2000, and 64 % in 1999. In general for the Elizabeth River watershed, species diversity and biomass were below reference condition levels while abundance was above reference condition levels. Community composition was unbalanced with levels of pollution indicative species above, and levels of pollution sensitive species below reference conditions.

### **Total Maximum Daily Load (TMDL) Activities**

#### Onancock Creek

Onancock Creek, located on the Eastern Shore, has three 303(d) listings for swimmable waters. The North Branch is listed for fecal coliform and DO while the South and Central Branches are listed for fecal coliform. A proposal by VIMS will have the TMDLs for bacteria and DO developed by 2005. Flow data, sediment data and BST data will be provided to VIMS in order to use the Hydrodynamic and Eutrophication Model (HEM3D) to simulate DO and nutrient dynamics. TRO will be responsible for the collection of sediment samples in each of the three branches. The sediment samples will be analyzed for organic carbon, organic nitrogen, organic phosphorous, ammonia, nitrate, and inorganic phosphorous.

#### Bacterial Source Tracking (BST)

Bacterial Source Tracking data have been collected at 5 stations within the Tidewater Region. This data will be used in TMDL bacteria development by determining the sources of fecal coliform violations and the load reduction needed to attain the applicable criteria. A total of 40 samples have been collected from July 2003 to February 2004 and submitted to MapTech Inc. for analysis.

### **Coastal 2000 Initiative**

The Tidewater Regional Office has been involved with the Coastal 2000 Program. Data has been collected in 2001, 2002 and 2003. For additional information, see the reference made under PRO: **Coastal 2000 Initiative - Water Quality, Biomonitoring and Sediment Toxicity of Virginia Estuaries.**

### **Pfiesteria Response and Monitoring Program**

During the years Tidewater Regional Office staff to support a Virginia Department of Health Cohort study conducted 1998-2001 sampling. Water quality and algae samples were obtained in order to determine the presence of Pfiesteria-like organisms (PLO). More information can be found under PRO: **Commonwealth of Virginia Pfiesteria Response and Monitoring.**

### **Impacts of Landfill Runoffs**

On June 25, 2003 a survey was conducted in Accomack County to document any possible impacts to a stream from a closed landfill. The stream is a tributary to Wattsville Branch, which eventually helps form Mosquito Creek. A property owner prompted a response by claiming a discoloration in the water. A site survey indicated a distinct orange coloration to a feeder stream coming from the direction of the landfill. It was determined that a bioassessment of the stream needed to be done. Results from the chemical analysis found elevated iron and manganese levels as well as turbidity, total suspended solids and fixed suspended solids. However, no toxic effects were observed due to the extreme abundance of benthic macroinvertebrates. One such species present was the Ptychopterids. They are pollutant tolerant species and have been associated with iron seeps. Also present was a bacterium, *Leptothrix*, which is capable of oxidizing iron and manganese. From this data, it was not possible to support the claim that the landfill is responsible for the stream conditions. Naturally occurring iron seeps may be present in this area, therefore causing the impact to the stream.

- **Northern Virginia Regional Office (NVRO)**
- **Probabilistic Biomonitoring and Chemical Monitoring Program in Virginia Non-Tidal Streams**

The Northern Virginia Regional Office (NVRO) has sampled fourteen (14) randomly selected probabilistic non-tidal stream stations in the Piedmont and Coastal Plain ecoregions. The Regional Biologist gathered representative samples of benthic macroinvertebrates, performed comprehensive habitat assessments, and obtained DO, temperature, pH, and conductivity data at the fourteen stations located in NVRO. Each biological station was sampled twice, once in the spring and again in the fall. One sampling event included water quality samples for nutrients, solids, toxics, chlorophyll a and bacteria as well as sediment sampling. All sampling was conducted in accordance with agency standard operating procedures for ensuring the quality of the data. New probabilistic stations are to be selected each year.

- **Total Maximum Daily Load (TMDL) Activities**

Highlights of the NVRO efforts to improve water quality in those streams segments that do not currently support designated beneficial uses are presented below.

### Monitoring in Support of TMDL Development

The NVRO established 51 special study water quality monitoring stations on selected streams identified in the 1998 303(d) *Total Maximum Daily Load Priority List and Report*. The special studies were designed to provide monitoring data to help better define the impaired stream segments, and to support TMDL development. Twenty-three stations were sampled monthly between July 1999 and August 2004

August 2000, and 28 stations were sampled monthly between July 2002 and August 2003. Each sampling event included water quality samples for fecal coliform bacteria and *E. coli*.

#### Completed and Planned TMDLs

As of the writing of this report, six TMDL reports covering 14 impaired segments have been completed in the Northern Virginia Region and approved by the U.S. Environmental Protection Agency (EPA). The fecal coliform bacteria TMDL for Mountain Run near Culpeper, Virginia was approved on April 27, 2001. Fecal coliform TMDLs for Accotink Creek (Fairfax County), Four Mile Run (the counties of Arlington and Fairfax, the cities of Alexandria and Falls Church), North Fork Catoctin Creek, South Fork Catoctin Creek and mainstem Catoctin Creek (Loudoun County), and Thumb Run (Fauquier County) were approved by the U.S. EPA on May 31, 2002. Bacteria TMDLs for Goose Creek, Sycolin Creek, South Fork Sycolin Creek, North Fork Goose Creek, Beaverdam Creek, Little River and Cromwells Run (Fauquier and Loudoun Counties) were approved on May 1, 2003. Benthic TMDLs are also being developed for two impaired segments in the Goose Creek watershed (Goose Creek and Little River) and will be submitted to the U.S. EPA in February 2004. Bacteria TMDLs for Limestone Branch and Piney Run (Loudoun County), Deep Run (Fauquier and Stafford Counties), Muddy Run (Culpeper County), Cedar and Licking Runs (Fauquier and Prince William Counties), and Carter and Great Runs (Fauquier County) are being developed and will be submitted to U.S. EPA in 2004. Four of these TMDLs are being developed internally using the Load Duration Approach.

#### Public Participation in TMDL Development

NVRO has made every attempt to go above and beyond the required elements of public participation in TMDL development. Technical Advisory Committees (TACs) consisting of local government representatives and stakeholders have been established in most watersheds to provide a forum for review and approval of technical information used and assumptions made in developing the TMDL. TAC meetings have been held in addition to the public meetings required under state regulations. In several cases, a third and sometimes fourth public meeting have been held in addition to the two required meetings to help keep the public informed of and encourage public participation in the TMDL development process. Extensive mailing lists have been developed, in some cases numbering in the hundreds of names, and used to help notify watershed stakeholders of upcoming public meetings. Finally, comment periods have been extended whenever practicable to provide as much time as possible for the submittal of public comments. In the densely populated Northern Virginia area, DEQ feels that it is especially important to involve the public in the TMDL process.

#### TMDL Implementation Plan Development

In addition to developing TMDLs in keeping with the increasing pace of the Consent Decree Schedule, The Northern Virginia Regional Office coordinated the development of the first urban bacteria TMDL implementation plan (IP), which was developed for Four Mile Run. The IP development process involved the coordination across four distinct jurisdictions of efforts ranging from pollution prevention (sanitary sewer inspection and maintenance, illicit discharge detection and elimination, septic system inspection and maintenance, and proper pet waste disposal), to mitigation measures (stormwater treatment, street and stormwater infrastructure management, stream corridor restoration, and stormwater runoff reduction and reuse), to general and directed outreach and signage efforts. The Northern Virginia Regional Office is also participating in the development of an IP for the bacteria TMDL developed for the Catoctin Creek watershed.

#### • **Lake Anna Monitoring**

The DEQ Citizen Monitoring Coordinator and the NVRO worked with representatives of the Lake Anna Civic Association (LACA) to develop a coordinated water quality monitoring plan for Lake Anna. The LACA organized a Water Quality Program in July 2000, which began monitoring 13 sites on the lake beginning in February 2001. This LACA monitoring program expanded to include 20 sites. DEQ has conducted its own water quality monitoring on the lake. These two monitoring programs have historically been conducted without coordination. In the Winter/Spring of 2002, DEQ and the LACA worked to develop a monitoring plan for the lake that is implemented using the combined resources of the NVRO



and the citizen volunteers. This combined monitoring effort began in April 2002, with the first coordinated lake sampling event. The monitoring plan incorporates a three-year sampling rotation where DEQ will monitor approximately one-third of the sites on the main lake each year. The LACA volunteers will monitor those lake stations that DEQ does not sample. The collaborative monitoring effort allows more extensive lake water quality monitoring than could be achieved individually by either the DEQ or the LACA. DEQ monitoring is conducted in accordance with agency lake monitoring guidance, and the LACA citizen monitoring is conducted in accordance with a DEQ-approved quality assurance plan.